

## Distribution of *Crataegus* species in Poland and Czechoslovakia

### Rozšíření druhů rodu *Crataegus* v Polsku a v Československu

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GOSTYŇSKA-JAKUSZEWSKA M.<sup>1)</sup> et A. HRABĚTOVÁ-UHROVÁ<sup>2)</sup> (1983): Distribution of *Crataegus* species in Poland and Czechoslovakia. — Preslia, Praha, 55 : 9—24.

The paper presents a survey of 13 species of the genus *Crataegus* L. occurring in Poland and in Czechoslovakia. The text is supplemented with maps.

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#### INTRODUCTION

Representatives of the genus *Crataegus* L. are not rare in the flora of Czechoslovakia and Poland, the genus being represented there by 13 macro- and microspecies and some interspecific hybrids. The following taxa reported from Poland and Czechoslovakia are not mentioned in this paper: *C. poloniensis* ČINOV., *C. heterodonta* POJARK., *C. plagiosepala* POJARK. and *C. leiomonogyna* KLOK. According to detailed systematic and biometrical investigations (GOSTYŇSKA-JAKUSZEWSKA 1972, 1975) these taxa remain within the limits of variation of *C. monogyna* JACQ. s. str. or are hybrids (*C. plagiosepala* POJARK.).

The intraspecific variation is considerable. Especially *C. monogyna* JACQ. has a very wide range and produces a mixture of various biotypes, sometimes represented as lower taxonomic units. *C. laevigata* (POIR.) DC. and *C. curvisepala* LINDM. are also variable and widely distributed species.

The distribution of *Crataegus* taxa is not regular. The greatest number of hawthorns grow in the west and south of Poland, being rarer in the north-east. *C. monogyna* JACQ. and *C. curvisepala* LINDM. are distributed all over the country. Other *Crataegus* species reach the limits of distribution in Poland or occur in scattered localities.

The distribution of hawthorns in Czechoslovakia, especially in Bohemia and Moravia, has been strongly reduced by agriculture. Particularly in the recent era, the habitats of this woody plant were unfavourably affected by consolidation of arable land, accompanied by the destruction of balks, an important ecotope of hawthorns. Nowadays the occurrence of hawthorns is mostly limited to habitats unsuitable for agriculture, such as ravines, steep slopes, remains of balks in the fields, margins of fields and woodland paths, forest edges etc. Nevertheless the hawthorn species in these countries are not rare, and due to various ecological conditions they show wide variation. That attests the morphological plasticity of *Crataegus*.

Warm slopes of semi-steppe character, often preserving Pannonian flora, are habitats rich in hawthorns, mainly in *C. monogyna* JACQ. Woodlands in

Bohemia and Moravia are mostly cultivated; the original natural forest stands were mostly replaced by spruce monocultures. Selecting sunny habitats, hawthorns do not penetrate into dark forest stands, not even deciduous. They occur in *Quercetum*, *Quercus-Carpinetum* etc. mostly only as sterile plants. The distribution of hawthorns in our countries is very irregular.

In Czechoslovakia, hawthorns grow especially in the low and higher hilly country, in submontane region, exceptionally they extend in the highlands.

The area under study, Poland and Czechoslovakia, is a region in which floristic influences of northern and southern as well as eastern and western Europe are detectable. Many of the hawthorn taxa present in these countries are also distributed in neighbouring Austria, Germany, most of Hungary as well as in the adjacent areas of the European part of the U.S.S.R.

This paper deals with the distribution of all the discussed species excluding hybrids and taxa of lower rank. The localities were compiled on the basis of herbarium material, personal collections and field investigations.

### 1. *Crataegus monogyna* JACQUIN 1775

This species is remarkable by its enormous variation, especially that of the leaves and fruits. Numerous subspecies, varieties and forms have been described. FRANCO (1968a, b) distinguished several subspecies within this variable hawthorn. There are numerous cultivars grown for ornament, often double-flowered. *C. monogyna* is often planted not only in gardens and parks when it spread into neighbouring habitats, but also on dikes, dams, water canals, railway embankments, near railway stations etc. Sometimes the cultivated shrubs are identical with the autochthonous *C. monogyna* JACQ. but at the other times they show differential characters of cultivars.

In Poland and in Czechoslovakia *C. monogyna* occurs mainly as subsp. *monogyna*, with several varieties and forms and rarely as subsp. *nordica* FRANCO. *C. monogyna* often produces hybrids, so that the genetically pure species is strongly reduced in localities. Most often it hybridizes with *C. curvisepala* LINDM. and *C. laevigata* (POIR.) DC.

*C. monogyna* is a subatlantic-sarmatic species (Atl.-W. Sib.), distributed over almost the whole of Europe. In the north, it grows in the British Isles, south-western Norway and southern Sweden. In the south, it is known in northern Africa, Turkey, Syria, Iran and the Caucasus. In East Europe, it reaches the middle and lower parts of the river Volga. *C. monogyna* is common in the lowlands as well as lower mountain elevations. The highest situated localities were reported from the Alps, 1500 m (HERMANN 1956) and Turkey, 2200 m (BROWICZ 1972).

*C. monogyna* is common in Poland and Czechoslovakia (fig. 1). In Poland it reaches its altitudinal maxima in the Gorce Mts.: Lubań (1120 m); Działy Orawskie: Podszkle (805 m); Pieniny Mts. (about 660 m) and in the vicinity of Muszyna (550 m), (GOSTYŃSKA-JAKUSZEWSKA 1972, 1973). *C. monogyna* is a frequent component of open and xerothermic deciduous forests; it also grows in xerothermic scrub of the order *Prunetalia*, on the slopes of the hills, ravines, river valleys and on forest edges. It is very often found on balks among arable fields, on roadsides and on railway embankments. This species is regarded as typical on forest edges and scrub mainly of the *Quercus-Fagetes* class.

In Czechoslovakia, *C. monogyna* can hardly find suitable habitats in the agricultural areas of Moravia and Bohemia. It occurs there in rather dry,

exposed territories of the Pannonian flora: Bohemian Karst, České středohoří Mts., Labe-lowland, Pavlovské vrchy Hills, Hády near Brno, slopes over Pouzdřany and Kurdějov; Kovačovské kopce Hills, Juhoslovenský kras etc. It also grows in the pine-forest on the serpentine slopes "Mohelno" (near Třebíč). The species is scattered in the foothills of the Českomoravská vrcho-

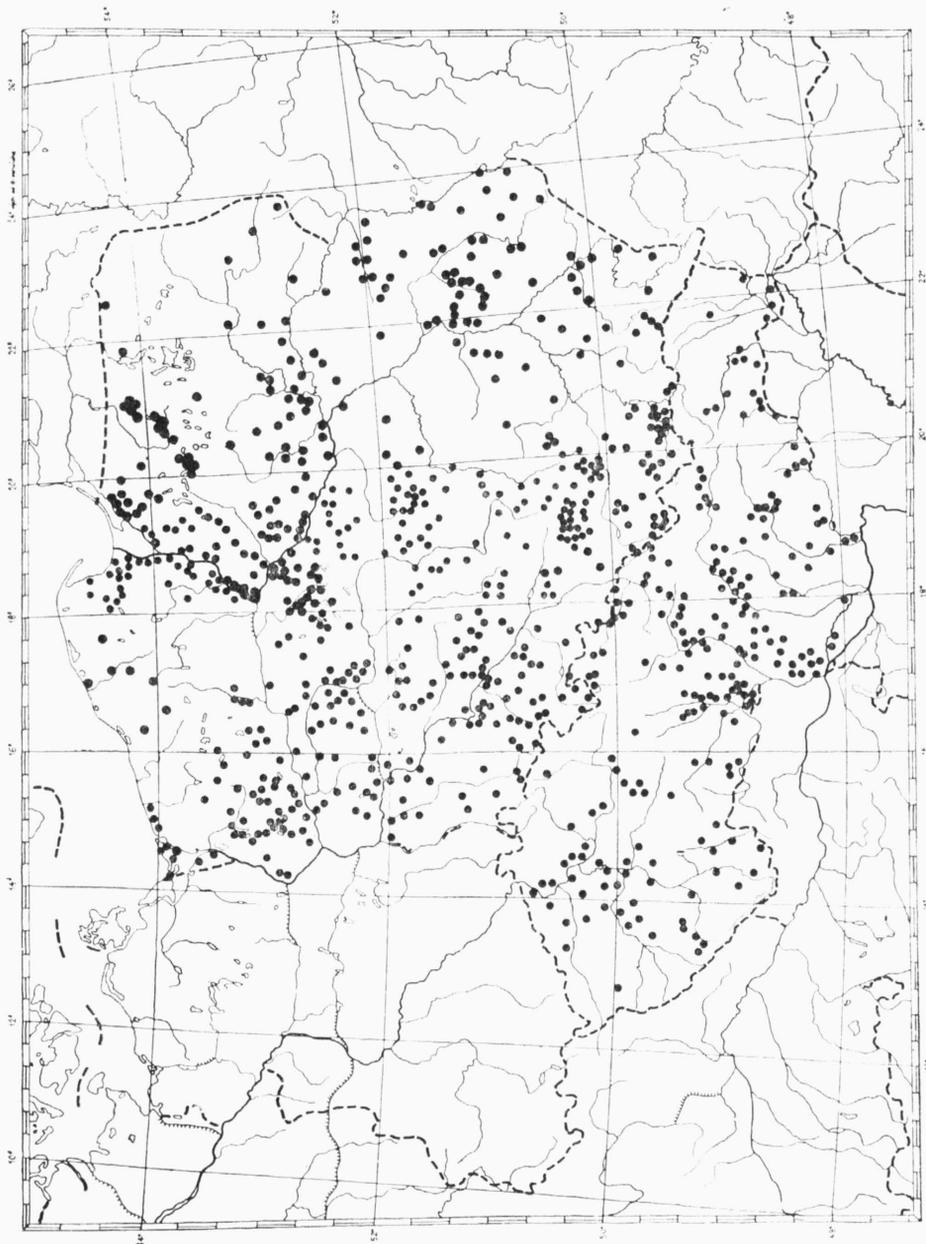


Fig. 1. — Distribution of *Crataegus monogyna* Jacq. in Poland and Czechoslovakia.

vina Highlands and of the Jeseníky Mts. near Branná (600—700 m), where it occurs only in warmer valleys (HRABĚTOVÁ-UHROVÁ 1979). In higher and colder situations it is often replaced by *C. curvisepala* LINDM. and *C. macrocarpa* HEGETSCHW.

The distribution of *C. monogyra* in Czechoslovakia especially in warmer localities in southern Moravia corresponds to its rich occurrence in South Europe.

## 2. *Crataegus curvisepala* LINDMAN 1918

Owing to different opinions as to the taxonomic status of this species, its general distribution is still insufficiently known. LINDMAN (1918) segregated *C. curvisepala* from *C. monogyra* JACQ. Several times it was listed incorrectly as *C. kyrstostyla* FINGERH. (POJARKOVA 1939, 1950, 1960; POLETIKO 1954). FRANCO (1968a, b) included *C. curvisepala* as a subspecies into *C. calycina* PETERM. HOLUB (1970) opposed this conception. The investigations carried out by ČINOVSKIS (1971) and GOSTYŇSKA-JAKUSZEWSKA (1973, 1975) also showed that *C. curvisepala* represents an independent species.

It may be presumed that *C. curvisepala* ranges throughout the whole of Europe; in the south-east, it is more frequent than *C. monogyra*; in the north it reaches the British Isles, the south-western part of the Scandinavian Peninsula (RYBERG 1954) and the region of Leningrad in the U.S.S.R. *C. curvisepala* is distributed also over the Balkan Peninsula: from Bulgaria it has been reported by JORDANOV (1973) among the synonyms of *C. monogyra* JACQ. f. *kyrstostyla* (FINGERH.) BECK as *C. calycina* PETERM. subsp. *curvisepala* (LINDM.) FRANCO as commonly distributed. DŽEKOV (1974 : 52) reports *C. calycina* subsp. *curvisepala* from Macedonia (900—1540 m) in Yugoslavia. In Greece, the species is known as a mountain plant, extending up to 1300—1600 m alt. According to BYATT (1976 : 28), the north of Greece is the southern limit of the European range of this species. It reaches the southern parts of the U.S.S.R. (the Ukraine), the Caucasus (POLETIKO 1954); in Turkey (BROWICZ 1972) it was found at 1800 m.

In Poland, this species is dispersed over the whole country, but seems to be more frequent in the southern and southeastern regions (fig. 2). The highest situated localities were found in the Western Bieszczady Mts.: Wyżniański Wierch (880 m), the col between Polonina Caryńska and Wyżniański Wierch (865 m), in the Pieniny Mts. — Branisko (Żar, 830 m), on Działy Orawskie Mts., Podwilk, in scrub westwards from the Beskid Mt. (705 m), at Piekielnik Sołystwo (695 m), and in Sidzina Mała on the mount Wojstojów (675 m), (GOSTYŇSKA-JAKUSZEWSKA 1972, 1973). It usually occurs as a component of undergrowth in deciduous forest (oak and beech-hornbeam), sometimes in coniferous woods (pine), and can also be encountered in oak-hornbeam woods. It is frequent on forest edges, in xerophilous scrub on mountain slopes, hills and river valleys, and sometimes on balks, by the roads and railway embankments. *C. curvisepala* grows usually on fertile loams rich in calcium, on loess and only occasionally on sandy soil. Its phytosociological status has not yet been clearly defined. It may be assumed that, like *C. monogyra*, it is a species characteristic of the *Quercus-Fagetum* class.

In Czechoslovakia, *C. curvisepala* is only scattered, not common (fig. 2). In Bohemia it occurs in the basaltic country of Ústí nad Labem on the hills Velký Ostrý, Jedlová hora and near Krásné Březno (250—400 m) often with *C. macrocarpa* HEGETSCHW. — In the vicinity of the spa Mariánské Lázně this species can be encountered also with *C. laevigata* (POIR.) DC. and *C. macrocarpa* HEGETSCHW. on the hills Podhorní vrch (840 m), Babylon (700 m) and near Ůšovice (550 m). It grows on the basaltic hill Vladař SE

of Žlutice. — In East Bohemia *C. curvisepala* has been observed for instance in a forest near the castle Hrubá Skála (c. 500 m). — In the territory of Hradec Králové it was found on forest edges near Hrádek u Nechanic. — In the Železné hory Mts. *C. curvisepala* is dispersed with *C. macrocarpa* on

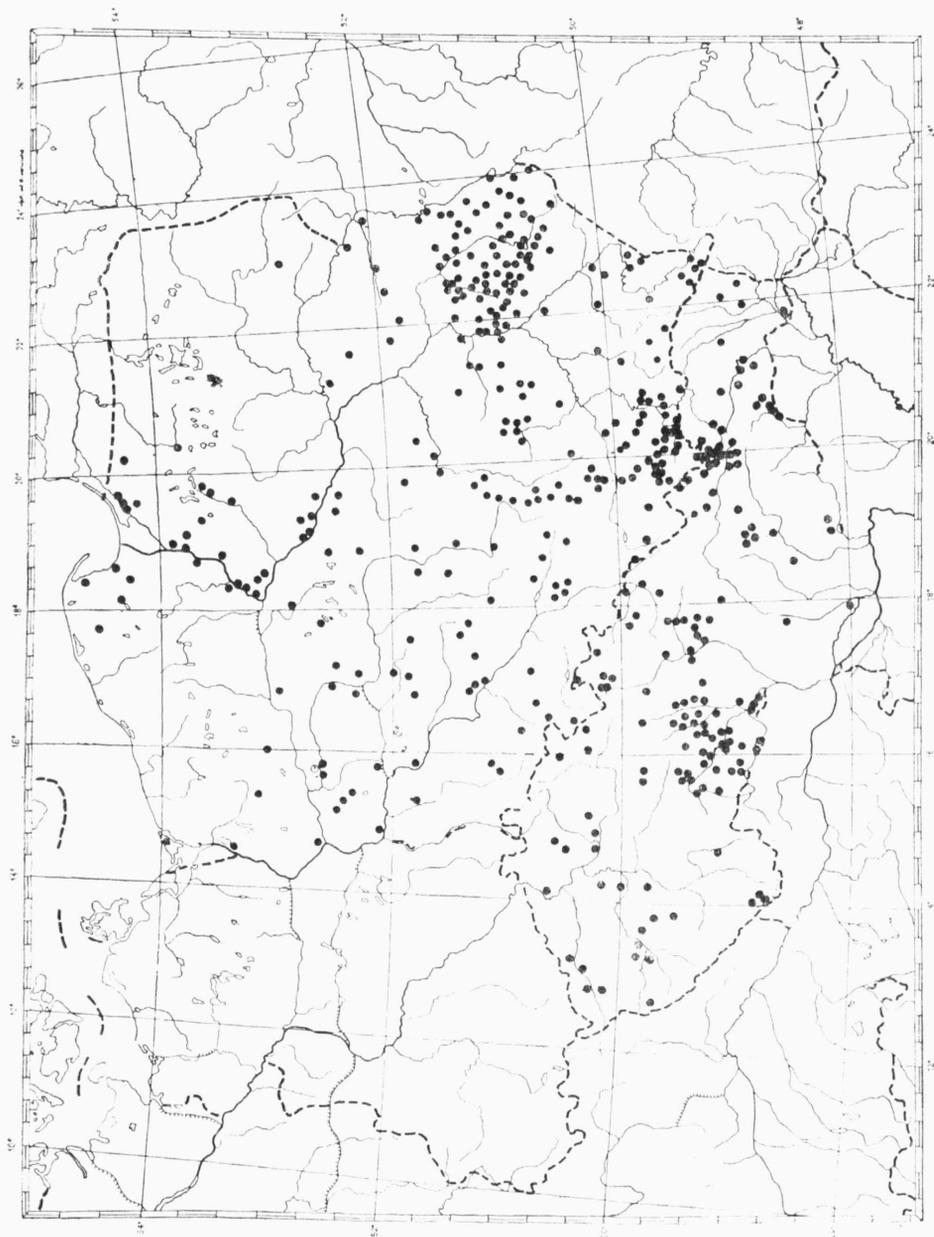


Fig. 2. — Distribution of *Crataegus curvisepala* Lindm. in Poland and Czechoslovakia.

the slopes and balks over the Seč dam (near Ústupy, about 500 m), on the ruins of Oheb (560 m).

In the Šumava Mts. in the vicinity of the Lipno dam NE of Slupečná *C. curvisepala* and *C. macrocarpa* form abundant shrubs on wide balks and forest edges (730—750 m). It was found likewise on the hillside not far from the town Horažďovice and on the slopes over the Otava river near the town Sušice.

In Moravia *C. curvisepala* grows also in the hilly country between 300 and 700 m. In the Českomoravská vrchovina Highlands: Brtnická pahorkatina Hills (600—690 m); Žďárské vrchy Hills (690 m, near Studnice, district of Nové Město na Moravě); in the foothills of the Jeseníky Mts., in the catchment area of the Branná river (600—700 m). In the area of Moravský kras it is found scattered (350—450 m, near Jedovnice), with *C. monogyne* mainly in the locality Hády near Brno (250—424 m), similarly as in South Moravia — Pouzdřanské kopce Hills, slopes over Kurdějov (250—400 m) etc.

In Slovakia, *C. curvisepala* extends into higher elevations; it reaches 1000 m in the Velká Fatra Mts. over Donovaly; at Šturec on edge of a beach-forest 1240 m; on the slopes of the Low Tatra Mts. 700—800 m in the valley Jánska dolina; in the High Tatra Mts. 900—1050 m on the Malý Baranec Hill; in the Kremnické pohorie Mts. (over the village Turček) it reaches the altitude of 950 m.

In Czechoslovakia, variation in the shape of leaves and fruits may be observed, which is due to the wide distribution of the species. It occurs often together with *C. macrocarpa* and *C. laevigata* and many times produces hybrids with them; it hybridizes also with *C. monogyne*.

### 3. *Crataegus lindmanii* HRABĚTOVÁ-UHROVÁ 1969

This species was described from Czechoslovakia by HRABĚTOVÁ-UHROVÁ (1969a). According to the investigations carried out by HRABĚTOVÁ-UHROVÁ (1969b) and ČINOVSĀIS (1971), as well as detailed taxonomic examinations by GOSTYŇSKA-JAKUSZEWSKA (1973, 1975), supported by numerical methods, *C. calycina* PETERM. (PETERMANN 1849) is a hybrid and cannot be identified with the hawthorn listed under the same name from Sweden by LINDMAN (1904, 1918). It follows that these two hawthorns are taxonomically different.

On the basis of herbarium material and bibliographic data one may conclude that *C. lindmanii* HRABĚTOVÁ-UHROVÁ occurs in the Scandinavian Peninsula, in Belgium, Germany, Poland, Czechoslovakia, Hungary, Romania and in the European part of the U.S.S.R. (probably the Baltic republics and the Ukraine).

The occurrence of *C. lindmanii* in Poland, under the name *C. calycina* PETERM. em. LINDM., was noted by SZAFER (1923) and KOBENDZA (1955). According to these authors, it was common both in lowland and lower mountain situations. However, observations by GOSTYŇSKA-JAKUSZEWSKA as well as revised herbarium material, showed that this species was very rare in Poland. Its localities are dispersed over the south of the country but they are rare in the northern or western parts (fig. 3). Generally it grows singly on slopes of river valleys and ravines, or on mountain sides, in xerophilous scrub and, more rarely, in open deciduous forests. The highest altitudes are reached in the Działy Orawskie Mts. — Harkobuz (about 795 m), in the

Gorce Mts. at the access to Gore (700 m), in the Pieniny Mts. on the road from the village Haluszowa to Kurzejówka (620 m) and in the Kielce region on Grzywy Korzeczkowskie (333 m), (GOSTYŃSKA-JAKUSZEWSKA 1972, 1973). The phytosociological character of this species has not been precisely defined.

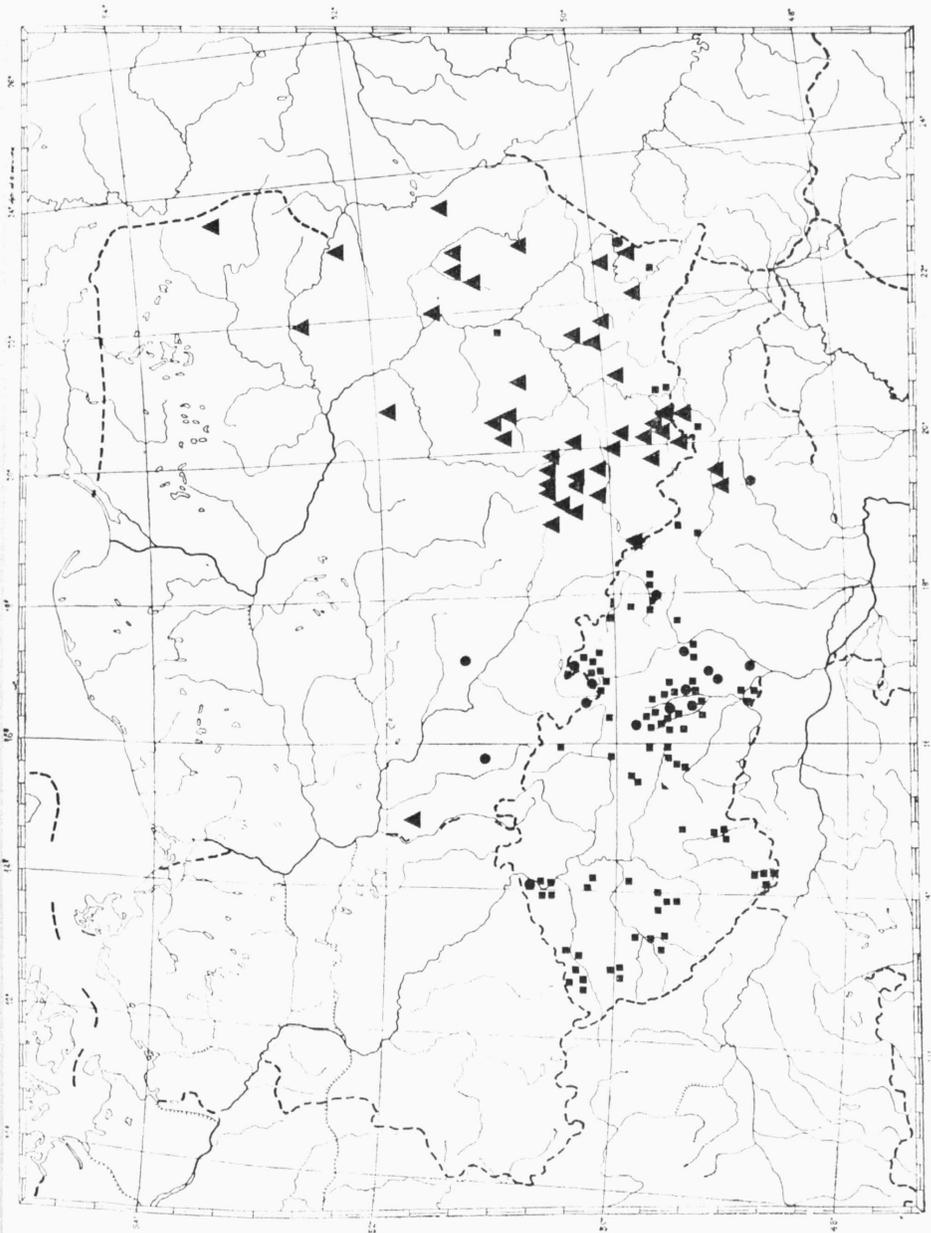


Fig. 3. — Distribution of *Crataegus lindmanii* HRABĚT.-UHR. (▲), *Crataegus macrocarpa* HEGETS.-CHW. (■) and *Crataegus palustris* LINDM. (●) in Poland and Czechoslovakia.

Most frequently it has been observed in patches of xerophilous plants. It hybridizes with *C. laevigata* (POIR.) DC. and with *C. monogyna* JACQ.

In Czechoslovakia, the situation is most likely the same as in Poland. *C. lindmanii* seems to be a rare species. In Bohemia and Moravia its occurrence is doubtful but it is known to occur in Slovakia (fig. 3). Very probably, *C. lindmanii* is a receding species. For example, in the Low Tatra Mts. (Jánska dolina valley), where it is taxonomically identical with Swedish and Polish plants, there is no danger to hawthorns: plants of *C. laevigata*, *C. curvisepala* and *C. macrocarpa* are there well developed, but *C. lindmanii* is rare and the shrubs are poorly branched.

From Slovakia, the following collections by HRABĚTOVÁ-UHROVÁ from the limestone substratum in the foothills of the Low Tatra Mts. are known: Kameničná near Liptovský Ján (700 m); Beňuška (720 m); on rocks Brezinky (710 m) between Liptovský Ján and Zavážna Poruba; on edges of a mountain forest on the left side of the river Váh below Liptovský Hrádok (700 m).

According to A. ROUBAL (in litt.) *C. laevigata* × *C. lindmanii* occurs scattered in Bohemia where the second parent is not known. This hybrid grows also rarely in Moravia and Slovakia.

#### 4. *Crataegus laevigata* (POIRET) DC. 1825

Most European authors regarded this taxon as *Crataegus oxyacantha* L. em. JACQ. (HRABĚTOVÁ-UHROVÁ 1974, 1978). However, BYATT (1974), having revised the Linnaean material in the Linnaean herbarium in London, demonstrated that *C. oxyacantha* is a "nomen ambiguum". We have therefore used the name *Crataegus laevigata* (POIR.) DC.

*Crataegus laevigata* occurs mainly in western European countries where it probably reaches northern Spain. The eastern boundary of its range runs across Poland and the U.S.S.R. (western Ukraine and the Baltic republics). In the north *C. laevigata* grows in central England, Ireland (O'MAHONY 1975), southern Sweden, in the south it reaches the Balkan Peninsula; it has not been reported from Macedonia (DŽEKOV 1974), or from Greece (BYATT 1976). In the Alps there are localities above 1665 m (HEGI 1923).

In Poland it occurs usually in its typical form; several variations have been encountered in the lowlands. The highest localities were reported from the Tatra Mts. (1281 m); the Sudeten Mts. (1200m); Babia Góra Mts. (967 m); Beskid Wyspowy Mts.: on the slopes of Lugoboszcza (750 m), Gorce Mts. (645 m); Mt. Tempkowa near Sidzina Górna (630 m); vicinity of Krośnica near Krościenko (600 m); the Radziejowa Range in the Sądec region (550 m), (GOSTYŃSKA-JAKUSZEWSKA 1972, 1973). In Poland *C. laevigata* is more frequent in the south-western and southern parts than in the north. Its localities are scattered and not very abundant; east of the river Vistula and San they occur only occasionally (fig. 4). In general, *C. laevigata* grows in open mixed deciduous usually hornbeam-beech or beech forests. However, in Poland it occurs singly or in small clusters in oak-hornbeam or oak-elm forests also in marshy meadows with willows or with willows and poplars. It is also frequent on the forest edges, among xerophilous scrub on hills and ravines, on the slopes of river valleys, on escarpments and balks, in scrub, and mountain sides. It grows best on fresh and deep loam or humus, or soils rich in calcium. According to OBERDORFER (1949), this species is characteristic of the *Quercus-Fagetea* class and occurs usually in communities of the orders *Fagetalia* and *Quercetalia pubescentis*.

In Czechoslovakia, *C. laevigata* appears to be a species contrasting ecologically with *C. monogyna*. While *C. monogyna* reaches its best development in exposed and sunny situations of often semi-steppe character, *C. laevigata* tends to grow in shaded situations. It grows on forest edges, in woodland belts but seldom penetrates deep into woodland, and reaches into shady

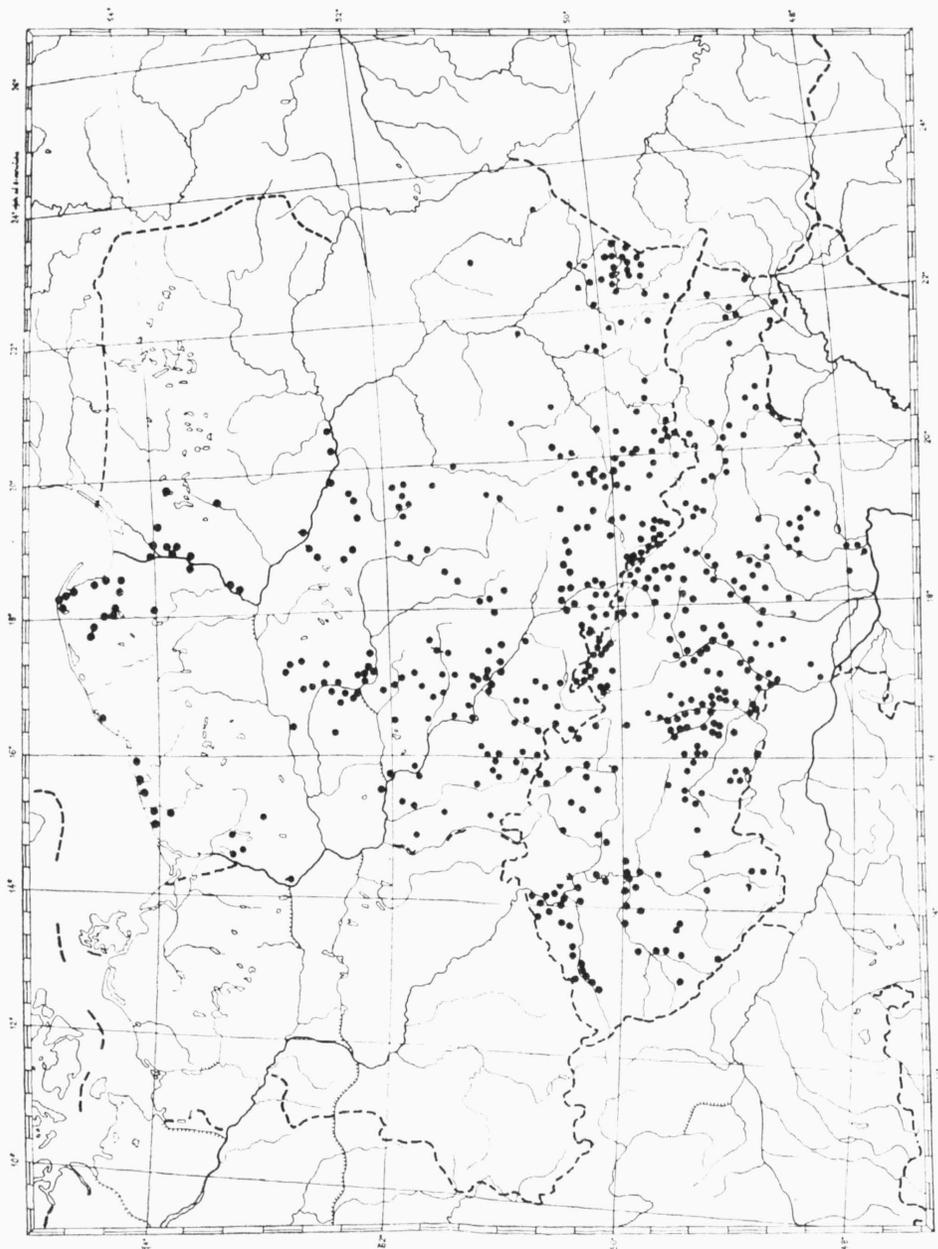


Fig. 4. — Distribution of *Crataegus laevigata* (Poir.) DC. in Poland and Czechoslovakia.

forests of the order *Fagetalia* (*Fagion*, *Carpinion* etc.). It occurs only in thinned *Quercetum*, *Quercu-Carpinetum* etc. as well as in mixed forests, in the form of slender trees or shrubs, often sterile (Hády near Brno in *Quercu-Carpinetum*, Pouzdřanské kopce Hills in an association of *Quercion pubescentis*). Sometimes it is a component of shrubberies on forest edges, along forest rides and in pastures abutting woodland. *C. laevigata* sometimes occurs in the characteristic habitats of *C. monogyna*, where the primary woodland was replaced by xerothermic vegetation.

In Czechoslovakia (fig. 4), *C. laevigata* grows mainly in the hill-country. In Bohemia for example it occurs on the Komáři Výška Hill in the Krušné hory Mts. (785 m), in the environs of Ústí nad Labem (290–350 m); on the Babylon Hill above Mariánské Lázně (700 m) and in the foothill of the Panorama Hill (780 m) there, and further in the foothills of the Orlické hory Mts. in the environs of Rychnov nad Kněžnou (650 m). In a damp forest in the vicinity of Hradec Králové (245 m). — In the Železné hory Mts. over the Seč dam (c. 600 m). In South Bohemia near the elevation point 613 m above Domažlice in the Český les Mts.; on fish-pond sides in the territory of Protivín (450 m) and Vodňany (400 m). — In South Moravia it occurs also in marshy forests by the river Morava near Mikulčice and Lanžhot (150 to 160 m).

In Slovakia it is abundant and reaches into the montane belt. The highest elevations are: Strážovská hornatina Mts. (Vápeč 956 m), Chočská Fatra Mts. (Sivý vrch 950 m); Západní Tatry Mts. (Baranec 930 m); Nízke Tatry Mts. (Jánska dolina valley 700–800 m, above Liptovský Hrádok 900 m). — Slovenské Rudohorie Mts. (pastures above Brusno c. 1000 m; pastures on slopes of the Mt. Poľana above the village Detva 1100 m).

In both Poland and Czechoslovakia, *C. laevigata* occurs mainly as subsp. *laevigata*; the species produces a number of lower taxa. Hybrids in which *C. laevigata* has participated are abundant. *C. roubalii* ČHREK et KŘÍSA from East Slovakia is probably a hybrid (*C. laevigata* × *C. curvisepala*).

*C. laevigata* is a European plant of a distinctive subatlantic character.

##### 5. *Crataegus palmstruchii* LINDMAN 1918

This species was established by LINDMAN in 1918. However, opinions concerning its taxonomic status differ considerably. Some taxonomists maintain that it is either a variant of *C. oxyacantha* or a form of *C. oxyacantha* with large leaves or large fruits (HRABĚTOVÁ-UHROVÁ 1956, 1958, 1964) or its subspecies (FRANCO 1967, 1968a; HRABĚTOVÁ-UHROVÁ 1969a, b, 1973b). Other authors regard *C. palmstruchii* as an independent species, e.g. BATKO (1935), HADAČ (1947), SZAFER, KULCZYŃSKI et PAWŁOWSKI (1953), KOBENDZA (1955), MANG (1968), ČINOVSKIS (1971), GOSTYŇSKA-JAKUSZEWSKA (1973, 1975), DOLL (1976). BYATT (1975) believes that this is *C. laevigata*. In many papers, this species is not mentioned at all.

*C. palmstruchii* differs from *C. laevigata* by the large leaves and fruits and usually also by the pubescence of leaves, particularly on the major veins beneath and in their angles; the petioles are also somewhat pubescent. A difference may also be in their ploidy.

The general distribution of *C. palmstruchii* is not yet known. The species has been reported from southern Sweden, Belgium, Germany, north-western parts of the U.S.S.R., Czechoslovakia

and Poland. Phytogeographically, *C. palmstruchii* most likely agrees with *C. laevigata*. According to FRANCO (1967, 1968a) *C. palmstruchii* occurs frequently in the eastern part of the range of *C. laevigata* and in the mountains. All these data, however, are questionable since the descriptions, photographs, and drawings given do not correspond entirely to the diagnosis and drawings in LANDMAN's paper.

In Poland, only 5 stands have been noted (fig. 3), (GOSTYŃSKA-JAKUSZEWSKA 1973, GOSTYŃSKA-JAKUSZEWSKA 1974, PELC 1979 in herb.). 1. Ostrzyca hill near Proboszczów; 2. Forest edge by the road from Trzebnica to Oleśnica; 3. Międzyzlesie, in scrub near Bochniak massif (BORATYŃSKI 1973 in herb.); 4. Tuł mountain near Cieszyn (PELC 1979 in herb.); 5. Between Pralkowce and Lipniak south from Przemyśl. Here this species usually grows in dry bushwood or on forest edges, mostly on soil rich in calcium.

In Czechoslovakia, *C. palmstruchii* is scattered throughout the country especially in the submontane region but also in lowlands (fig. 3) most frequently accompanying *C. laevigata* and *C. curvisepala*. It grows in Bohemia above Ústí nad Labem at Strážovice (320 m); above Hlásnice near Svojanov (550 m); often in the Jeseníky Mts. in the vicinity of Branná (Dvorský vrch, 650 m), above Vikantice (620 m) etc.; Rychlebské hory Mts.: Javorník Mt. (350 m); on forest edges above Vápenná (450 m) etc.; in the Ostrava area it grows near Bludovice-Havířov (300 m); in the territory of Haná it is known in the vicinity of Kojetín near Kroměříž, in eastern Moravia from the Žilina Hill above N. Jičín (380 m, on picrite); in South Moravia above Kurdějov, in the forest Divácký les, on the slope above river Dyje near Vranov (390 m), in a lowland forest on the bank of the Morava river near Mikulčice (c. 150 m) etc. In Slovakia, *C. palmstruchii* is known from the Strážovská hornatina Mts. (Vápeč 950 m), near the castle Bojnice (in the valley Vendelín); Kremnické pohorie Mts. (above Krahule near Turčok, c. 950 m), Juhoslovenský kras (above the cave Domica, 400m) etc.

#### 6. *Crataegus macrocarpa* HEGETSCHWEILER 1840

This species was distinguished and reported by HEGETSCHWEILER from Switzerland in 1840. It has been evaluated in different ways. BUSER (1897) pointed out that it does not belong to *C. oxyacantha* into which it was included by some authors. Little attention has been paid to *C. macrocarpa*, it has been treated erroneously as a large-fruited form or variant of one- or two-pistilled hawthorns.

The fruits are 10–14 mm long and usually have tubercles on their bases; the narrowly lanceolate sepals are erect or nearly erect. The varying number of pistils (2 or 1) suggests that the taxon is of hybrid origin. The same characters are found also in *C. calycina* PETERM. 1849 and, hence, the latter should be classified with *C. macrocarpa*. — Investigations carried out using numerical methods (GOSTYŃSKA-JAKUSZEWSKA 1973, 1975) showed that the characters of *C. macrocarpa* are so distinct that it should be regarded as a separate species.

The general distribution of *C. macrocarpa* has not been sufficiently defined. According to HEGETSCHWEILER's data (HEGETSCHWEILER 1840), it grows in Switzerland, in scrub of hilly and submontane regions. FRANCO (1968a) maintains that *C. macrocarpa* is endemic to Europe, with localities dispersed throughout France, Austria, Czechoslovakia, Germany, Switzerland and Italy.

*C. macrocarpa* was first reported from Poland in 1970 by GOSTYŃSKA-JAKUSZEWSKA. At present, six localities of this species are known (fig. 3), (GOSTYŃSKA-JAKUSZEWSKA 1973, 1974): 1. Near Biedrzychów on the Wisła river (JAKUSZEWSKI 1962 in herb.); 2. Życzanów near Ryto on the Poprad river; 3. Between Żegiestów and Zubrzyk on the Poprad river; 4. Near Lesko; 5. Biernatki near Kórnik (BORATYŃSKI 1979 in herb.); 6. Szymbark near Gorlice (BORATYŃSKI 1979 in herb.).

In Czechoslovakia, *C. macrocarpa* is rather abundant, occurring in its typical form (fig. 3) in submontane region together with *C. laevigata* and *C. curvisepala*. *C. macrocarpa* shows properties of a good species; beyond doubt it is of hybridogeneous origin [a stabilized hybrid, *C. curvisepala* LINDM. × *C. laevigata* (POIR.) DC.].

The distribution of *C. macrocarpa* in Czechoslovakia is similar to that of *C. laevigata*. It is abundant in some hilly regions, for instance in northern Bohemia near Frýdlant on forest edges sporadically, in the vicinity of Ústí n. Labem on basalt near Krásné Březno, Nová Ves, on the hills Vel. Ostrý, Strážovická hora etc.; on slopes over Mariánské Lázně; over the Seč dam (500—560 m) in the Železné hory Mts. In the Šumava Mts.: in the vicinity of the Lipno dam, near Horažďovice, in the vicinity of Sušice etc. In Moravia in the Československá vrchovina Highlands it grows rather abundantly on forest edges, between pastures and fields, on foothills (Čebínka, Květnice near Tišnov etc.), in the Žďárská vrchovina Hills it is frequent in the district of Nové Město na Moravě (near Studnice 720 m and often elsewhere), in the vicinity of the market-town Lomnice u Tišnova on the slopes of Sýkoří Hill (580—650 m); in the Jihlavské vrchy Hills in the environs of Mrákotín, Telč, Krahulov (550—680 m). — In the Moravský kras: Josefovské údolí valley, Říčka valley, semi-steppe locality Hády near Brno; in South Moravia in the Dyje valley near the castle Bítov, in an oak-forest on rocky slopes of Rosenberg (450 m) in the Dyje valley. In the Jeseníky Mts. in the vicinity of Branná-Vikantice and near Bruntál (Uhlířský vrch). Near Krnov NE in a forest (360 m) etc.; above Hradec near Opava; Hukvaldy.

In Slovakia it is known to occur in the Upper Váh valley above Ružomberok (above 500 m), but the highest elevations are reached in the Západné Tatry Mts. at slopes of Mt. Baranec (940—1000 m); in the Kremnické pohorie Mts. above the village Krahule (950 m). In East Slovakia it has been encountered also in the vicinity of Bardejov and elsewhere.

#### 7. *Crataegus calciphila* HRABĚTOVÁ-UHROVÁ 1956

This is a microspecies, perhaps a stabilized hybrid, having originated most probably from the hybridization *C. laevigata* (POIR.) DC. × *C. lindmanii* HRABĚT.-UHR. The fruits are red, ellipsoidal or sometimes subcylindrical, lacking basal tubercles, 9—12 mm in length, the sepals erect or semi-erect. The shrubs are densely branched but the branches are mostly thin.

The taxon is closely related to *C. macrocarpa* HEGETSCHW., but is not identical with it. *C. calciphila* has evolved quite independently; its relationship to *C. macrocarpa* is parallel, not subordinate. Its fruits resemble those of *C. lindmanii* having 1 or 2 pistils and the shape of leaves suggests that *C. laevigata* is one of the parent species. It is improper to consider *C. calciphila* to be a subspecies of *C. macrocarpa* (HRABĚTOVÁ-UHROVÁ 1967).

*C. calciphila* has been found to occur mainly on Devonian limestone (Hády near Brno), basalt (near Ústí nad Labem) and scattered also in other situations; the general distribution is unknown.

Phenologically, *C. calciphila* is unique in starting to blossom one week after *C. laevigata* and one week before *C. monogyna*.

In Czechoslovakia *C. calciphila* grows on warm slopes of semi-steppe character.

#### 8. *Crataegus rosaeformis* JANKA 1874

*Crataegus rosaeformis* differs from the related taxa by the pubescence of the leaves and by the fruits more or less pubescent even when ripe. It is a microspecies intermediate between *C. monogyna* JACQ. and *C. curvisepala* LINDM.

So far it has been found scattered in sunlit scrubby plains of the Juhoslovenský kras above the Domica Cave.

The species was described by JANKA from Baile Herculane in Banat, Romania.

PÉNZES (1954) reported *C. rosaeformis* as a synonym of *C. calycina* var. *hirsuta* (SCHUR) PÉNZES from other two localities in Romania.

#### 9. *Crataegus silesiaca* HRABĚTOVÁ-UHROVÁ 1973

This is a microspecies related to *C. curvisepala* LINDM. and *C. macrocarpa* HEGETSCHW. It has ellipsoidal fruits, 10–15 mm in length, with sepals narrowly lanceolate to awl-shaped, mostly hook-like, erect to semi-erect, 3–5 mm in length. *C. silesiaca* was identified as a component of shrubberies on the basaltic Uhlířský vrch Hill near Bruntál, in the vicinity of Krnov, and in the valley of the Čížina brook near Úvalno in northern Moravia.

Hybrids with *C. laevigata* and *C. curvisepala* have been observed in the vicinity of Krnov.

#### 10. *Crataegus mikulčicensis* HRABĚTOVÁ-UHROVÁ 1973

This taxon was found in the lowland forest on the right bank of the Morava river between the villages of Mikulčice and Lužnice not far from the archaeological excavations at Mikulčice, and in the Záhorie region in Slovakia. It is rare.

From other hawthorns this microspecies differs by its large fruits (15–18 by 10–11 mm), pear shaped or ellipsoidal in shape, tapering to the base.

#### 11. *Crataegus domicensis* HRABĚTOVÁ-UHROVÁ 1969

*C. domicensis* is a conspicuous one-pistilled hawthorn microspecies, with bright red fruits, almost spherical or broadly ellipsoidal in shape and 13 to 16 mm in diameter, with erect or semi-erect sepals. So far it has been found only in the Juhoslovenský kras area, mainly on a limestone slope above the Domica Cave.

#### 12. *Crataegus bohémica* HRABĚTOVÁ-UHROVÁ 1973

This microspecies is closely related to *C. macrocarpa* but its fruits are bright red even when dry, 9–11 mm in length, with sepals curved downwards. So far it is known to occur only on the Radobýl Hill near Litoměřice.

### 13. *Crataegus lepida* HRABĚTOVÁ-UHROVÁ 1973

This is a small-leaved hawthorn microspecies related to *C. laevigata* with serrate leaves 10—20 × 8—16 mm in size. The fruits are almost spherical in form and are covered by minute warts. So far, the species has been found to occur near the village Dubice, district of Litoměřice in the České středohoří Mts.

#### SUMMARY

The paper contains a brief survey of the genus *Crataegus*, including six major species (*C. monogyna* JACQ., *C. curvisepala* LINDM., *C. lindmanii* HRABĚT.-UHR., *C. laevigata* (POIR.) DC., *C. palmstruchii* LINDM., *C. macrocarpa* HEGETSCHW.), distributed in Poland and Czechoslovakia, and seven microspecies occurring in Czechoslovakia (*C. calcephila* HRABĚT.-UHR., *C. rosaeformis* JANKA, *C. silesiaca* HRABĚT.-UHR., *C. mikulcicensis* HRABĚT.-UHR., *C. domicensis* HRABĚT.-UHR., *C. bohémica* HRABĚT.-UHR., *C. lepida* HRABĚT.-UHR.). The distribution of the microspecies is shown on the maps. The microspecies are local, mostly limited to particular conditions.

The paper is based on the authors' field studies and study of herbarium material contained in the major collections of both countries.

In this paper no consideration is given to many infraspecific taxa and numerous hybrids.

#### SOUHRN

Společná práce M. Gostyńské-Jakuszewské a A. Hrabětové-Uhrové obsahuje stručný přehled rozšíření 6 makrospecií rodu *Crataegus* L. (*C. monogyna* JACQ., *C. curvisepala* LINDM., *C. lindmanii* HRABĚT.-UHR., *C. laevigata* (POIR.) DC., *C. palmstruchii* LINDM., *C. macrocarpa* HEGETSCHW.), rozšířených většinou po celém území Polska a Československa, a 7 mikrospecií (*C. calcephila* HRABĚT.-UHR., *C. rosaeformis* JANKA, *C. silesiaca* HRABĚT.-UHR., *C. mikulcicensis* HRABĚT.-UHR., *C. domicensis* HRABĚT.-UHR., *C. bohémica* HRABĚT.-UHR., *C. lepida* HRABĚT.-UHR.), zjištěných jen v Československu.

Rozšíření makrospecií je znázorněno na mapkách; tím je naznačeno současně i jejich rozšíření ve střední Evropě.

Ač bylo popsáno mnoho infraspecifických taxonů, nejsou v práci uvedeny, stejně jako není věnována pozornost četným hybridům.

Studie byly provedeny na základě terénního výzkumu, studia herbářového materiálu v hlavních sbírkách obou zemí i s přihlédnutím k příslušné literatuře.

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J. Holub